

CLAIMS

1. A method of applying and accurately locating a plurality of caps to a plurality of microfabricated devices at the wafer stage, the method including:

- 5           a) forming, in a two part mold, a plurality of first hollow molded caps, from a layer of thermoplastic material which is placed in a mold, the mold having first and second mold halves which are brought together to form the caps, each cap having a central portion and a perimeter wall;
- 10          b) opening the mold so that the caps are carried as an array by the first half; then
- c) applying, using the first half, the array to one side of a wafer.

2. The method of claim 1 wherein, the mold and the wafer are made from the same material.

15          3. The method of claim 1 wherein, the mold is made from a semiconductor.

4. The method of claim 1 further comprising the step of separating the wafer into individual packages by a deep plasma etching process of the wafer for which process the  
20          first caps are a mask.

5. The method of claim 1 wherein, applying the caps further comprises using a cooperating release wafer having eject pins to urge the caps into position.

25          6. The method of claim 5 wherein, the first mold half has eject openings for receiving the pins, the pins being longer than the openings.

7. The method of claim 5 wherein, there is a gap between the first mold half and the release wafer and using the release wafer further comprises applying a vacuum to the gap to draw the release wafer toward the first mold half.  
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8. The method of claim 1 wherein, the cap is formed from a layer of thermoplastic material that is etchable under an oxygen plasma etch.

9. The method of claim 8 wherein, forming the cap comprises heating the thermoplastic material in the mold with infrared radiation, the mold being essentially transparent to the infrared radiation.

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10. The method of claim 1 wherein, the first and second mold halves each have holes for receiving eject pins which are formed on adjacent release wafers, the pins being longer than the holes.

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11. The method of claim 1 wherein, the thermoplastic material is 200-500 microns thick prior to being formed into caps.

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12. The method of claim 1 wherein, when the mold is closed, there is a thin layer of the material from which the caps are formed joining the caps into an array and the thin layer is removed by a squeezing action of the mold itself.

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13. The method of claim 1 wherein, when the mold is opened, there is a thin layer of the material from which the caps are formed joining the caps into an array and the thin layer is removed by an etch.

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14. The method of claim 12 wherein, the thin layer is removed by the contact between unetched surfaces in the mold.

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15. The method of claim 5, wherein, the eject pins are flush with an interior mold surface during the forming.

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16. The method of claim 1, wherein, the first mold half has a lower surface into which is formed a series of recesses defined by lateral edges, the second mold half having an upper surface in which is formed a series of grooves, the grooves aligning with the edges, the recesses and grooves having a repeat spacing that corresponds to a spacing on a wafer to which the caps will be applied.

17. The method of claim 1, wherein the molds are pressed together in a conventional wafer bonding machine.

18. The method of claim 1, wherein:

5 the first half includes first holes formed through it;

there being provided a first half release wafer from which project pins;

the pins located in registry with the first holes;

the first half having a thickness in the area of the first holes, the pins being longer than the thickness;

10 the first half release wafer having a first position in which the pins are flush with interior ends of the first holes;

there being a gap between the first half and the first half release wafer when the first half release wafer is in the first position; and wherein

a vacuum is applied to the gap to eject the caps.

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19. The method of claim 18, wherein:

the second half includes second holes formed through it;

there being provided a second half release wafer from which project pins;

the pins located in registry with the second holes;

20 the second half having a thickness in the area of the second holes, the pins being longer than the thickness;

the second half release wafer having a first position in which the pins are flush with an interior end of the second holes;

there being a second gap between the second half and the second half release wafer 25 when the second half release wafer is in the first position.